UNIVERSAL VACUUM EXTENSION KIT

BACKGROUND OF THE INVENTION

This application is a Continuation-In-Part of Application Serial No. 09/676678 filed 02 October 2000, now

Field of the Invention

A universal vacuum cleaner extension kit extends the reach of standard cleaners.

Description of Related Art

Most vacuum cleaners come with some sort of extension and replacement parts. These prove to be satisfactory for the standard rooms, but do not meet the needs for high locations such as high ceilings, vaulted ceilings, high windows, and high foyers.

In the vacuum cleaner art, extensions are well known for reaching heights and for extending the horizontal reach from the collection cannister or bag. There is no universally accepted standard for tubing or connectors. However, most tubing and connectors used with vacuum cleaners vary from 1¼ inches to 1½ inches in diameter. B. Baxter (U.S. 2,122, 633, issued 5 July 1938) is an example of tubular extension sections having locking couplings between the sections. N. Okun (U.S. 2,801,437, issued 6 Aug 1957) teaches a tapered male and female coupling; N. Schneider (U.S. 5, 410,776, issued 2 May 1995) teaches small tapers

for frictionally securing parts of vacuum attachments to extension tubes; and, R. McDowell (U.S. 4,053,962, issued 18 Oct 1977) teaches several stepped and tapered inner surfaces for forcefully attaching a tubular vacuum cleaner section to various size nozzles, such as 1¼ and 1½ inch external diameter nozzles.

Elastic elements have been used with vacuum and air conducting conduits for various purposes. As examples, E. Martinet (U.S. 2,273,211, issued 17 Feb 1942) seals air leakage by covering a joint coupling with a one-piece rubber sleeve. W. Sheppard (U.S. 2,460,851, issued 8 Feb 1949) joins a connector to a bag using a molded rubber sleeve that is slightly less than the outside diameter of a tubular connector to frictionally grip it. M. Groves et al (U.S. 3,306,634, issued 28 Feb 1967) uses an elastic molded sleeve to make a joint air tight with cylindrical tubular front and rear ends and a corrugated central section. W. Aberilla (U.S. 3,922,753, issued 2 Dec 1975) uses stretchable elongated tubes over the ends of rigid tubes for rapid joining and sealing with different diameter rigid tubes joined by using a short length collar between the smaller diameter connector and the stretchable elongated tube.

SUMMARY OF THE INVENTION

The present invention is to components that attach to most cannister and upright vacuums. To meet the special needs for extending the reach of vacuum cleaners, this

invention provides extensions with a decreased uninterrupted internal diameter to increase velocity within the extensions for improved removal of dust, cobwebs and insects, an adapter joins hose extensions to different size connectors.

There are four to six extensions provided in the kit. Each extension has a male and a female plastic end connector with tapered surfaces that allow for easy slip-fit attachment to each other. The average height person with four three-foot extensions or six two-foot extensions can reach about seventeen feet in height. This allows a person to stand on one floor and vacuum the ceiling and corners of an above floor or a 2nd level.

There is an adapter provided for connecting the extensions to existing vacuum hoses, attachments, and pipes. It is primarily used to attach an extension to vacuum units having a smaller diameter conduit.

A flexible hose extension is provided for additional flexibility and additional operator freedom when using an existing hose. The flexhose is especially useful for upright vacuum cleaners in view of the short flexible hoses used on them as compared to the cannister type. While an extension can be attached to the upright flexible hose, a very limited freedom of movement usually results. Connecting the flexible hose of the invention to the flexible hose of a vacuum cleaner adds footage and use well beyond the vacuum cleaner. A tapered or stepped female fitting can be provided on the flexhose. With it a standard or smaller diameter

vacuum can be connected. The opposite end of the flexhose can be connected to the extension.

For additional flexibility an elastic adapter can be used for coupling odd-sized connectors. By deforming or stretching the adapter to fit within or over connectors, odd size connectors can be joined together.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an exploded view of an extension with parts shown separated and with sectional views of the end connectors.

Fig. 2 is a sectional side view of the adapter.

Fig. 3 is a sectional side view of a clog preventer.

Fig. 4 is a front view of the clog preventer of Fig. 3.

Fig. 5 is a view of a hose extension with the end connectors shown in section.

Fig. 6 is a sectional view of the female end connector of the hose extension with an alternate adapter insert.

Fig. 7 is a front view of a container housing the components of the extension kit.

Fig. 8 is a side view of the container of Fig. 7.

Fig. 9 is an isometric view of a simple elastic adapter.

Fig. 10 is a sectional view of an elastic adapter having internal radial ridges.

Fig. 11 is an isometric view of an elastic adapter having external longitudinal ridges.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Fig. 1 shows an extension **10** having an elongated tube **11** with female connector **19** and male connector **20**. The elongated tube has a wall thickness sufficient to make it self-supporting and capable of supporting an accessory (i.e. tool implement, etc.), other extensions, and the moderate lateral pressures used against surfaces to be cleaned. If stainless steel is used, a wall thickness of 0.01 to 0.02 inches has been found sufficient with ¾ to 1 inch diameter tubes. The female connector **19** is provided with a cylindrical opening **13** in a first end **12** to receive one first end of the elongated tube **11** with a tapered wall thickness that increases inwardly. A stop **14** is formed by having the wall thicker at a central inner location for locating the end travel of the elongated tube and strengthening the connector between the elongated tube and receiving first end **12** and an element held within the cavity **27** of the female connector second end **18**. The connector second end has an inwardly decreasing diameter that can have a uniform taper, or be stepped **28**, or a combination of the two, to receive standard diameter accessories or elements, or to be attached to the male end **52** of the flexhose or extensions. The inside diameter at the end **15** can be about 1½ inches, at the middle **17** 1⅜ inches, and at the base **16** 1¼ inches.

The male connector **20** includes a first end **21** having a cylindrical opening **22** that receives a second end of the elongated tube **11**. A thicker wall **23** with a slightly smaller internal diameter **25** at the base of the cylindrical opening **22** acts as a stop for the elongated tube. The second end **24** of the male connector **20** is provided with a modest external taper that gives a slightly larger outside diameter **24a** at the central area and a slightly smaller outside diameter **24b** on the second end. The outside taper is also designed to engage a female connector of another extension or standard accessory or the adapter **30** so as to attach to smaller accessories.

The extensions can be made from various metal and plastic materials that offer strength, rigidity and light weight. Since the assembled extension must be strong enough to be essentially self supporting, stainless steel tubing is preferred. Most plastics have been found to be too flexible, heavy and hard to control. The end connectors or fittings are preferably ABS plastic attached to the tubing with a high strength adhesive such as CA-50 GEL sold by 3M Corporation. A ¾ to 1 inch diameter tube has about 0.44 to 0.79 square inch of flow area, while a 1¼ to 1½ inch diameter tube has about a 1.2 to 1.8 square inch flow area. By using tubes having a diameter of from ¾ to 1 inch, the velocity within the tube is increased by about 200% and the overall weight that must be manipulated is reduced.

The end connectors or fittings are somewhat larger or thicker than those that are used in the prior art. This is to accommodate the smaller diameter tube yet allows it to fit larger

diameter accessories found on some vacuum cleaner hoses and conduits. They also join the tubes such that an uninterrupted flow path extends through the tubes, when they are joined together, and gives the extensions a rigid support.

The female connectors, on their inner surfaces, and the male connectors, on their outer surfaces, can be provided with irregularities such as ridges or recesses around their circumferences or longitudinally. It has been found that a smooth surface male connector placed inside a smooth surfaced female receptor has such a hold that it is very difficult to pull them apart. This could be from a vacuum type hold created between the two. To overcome this problem, it has been found that ridges or recesses around the circumference or longitudinally on these surfaces provide the necessary grip for securing the two together while giving a reasonably easy release of the two. This use is illustrated as longitudinal recesses **29** inside female connector **19** of the extension **10** shown in Fig.1 and as circumferential ridges **57** on male connector **52** of the flexible hose **50** shown in Fig. 5. The preferred size of these irregularities is from 0.01 to 0.02 inches in height and up to 0.12 inches in width that extend from 1 to 1½ inches in length. The irregularities can be rectangular or rounded and may be tapered along their length in any given area they are used at. The recesses and ridges are designed into the connector so as to not let air in and/or the mating connectors are designed to make contact circumferentially and the inner and/or outer end of the connectors to block air leakage.

An adapter **30** is shown in Fig. 2. The first end **31** has a cylindrical outer surface and a tapered inner opening **32**. The outer opening first end **32b** has a larger diameter than the inner opening second end **32a** for example. This opening **32** accommodates male extensions generally ranging from 1.16 to 1.25 inches. This could be the male connector **20** of extension **10** or the male connector of some larger element or accessory. The second end **34** is joined **33** to the first end and has a passage **35** and a tapered outer wall with an inner outside diameter **34a** that has a larger diameter than the outer end outside diameter **34b**. The taper generally ranges from 0.09 to 1.15 inches and is designed to engage with the elements or accessories used on smaller vacuum sizes. The adapter allows the extensions, having a smaller diameter than commonly used, to connect to standard vacuums having a larger diameter, usually 1¼ to 1½ inch. Additional adapters can be provided to allow extensions to attach to accessories with smaller than standard diameters.

Figs 3 and 4 show a clog preventer **40**. The clog preventer can be used in areas having a large number of large particles. It is used to prevent entrance of these particles into areas that might permit clogging such as the smaller diameter flexhose and extensions. The clog preventer body **41** is similar in size and shape to the female connector end **32** of the adapter **30** of Fig. 2. A first open end gives access to area **42** that can fit over the male connector **20** second end **24** or over the male connector **52** outer surface **53**. A second closed end **44** is provided with apertures **43** permitting air and small particle passage.

Fig. 5 shows a hose extension **50** provided with the present invention. The hose extension has a flexible hose **51** with an inside diameter of about 0.75 inch having a male hose connector **52** on one first end and a female hose connector **67** on the second end. The male hose connector **52** has a threaded internal recess **55** for threading in the first end of the hose although it can be permanently bonded or molded in place. A hose stop **56** limits the distance the hose can be threaded into the male hose connector. The second end of the hose connector has a tapered outer surface **53** for placement in the female connector **19** of the extension **10.** As an alternative, attachments can be directly connected onto the tapered outer surface **53.** The male hose connector second end has an internal passage **54** that is essentially the same diameter as the extension passage diameter.

The hose extension **50** female hose connector **67** on the hose extension second end has a threaded first end **65** that receives the hose until a stop **66** is engaged. The female hose connector second end **63** has a taper **68** with a decreasing internal diameter going from the second end toward the first end. The second end taper is designed to receive the male connector end of the vacuums. An internal recessed insert **69** can be temporarily or permanently placed within the taper **68** of the connector second end **63** if necessary to fit other vacuum cleaners with smaller connectors. The internal recessed insert reduces the diameter of the tapered recess **68** from about 1.16 to 0.09 inches. The outside diameter of the second end **63** is approximately 1.5 inches which will fit onto vacuum extensions that are larger. The plastic or rubber used to make the elements, such as the female connector **67** of

Fig. 6, has enough resilience to expand or contract to accommodate slight differences existing between some vacuum cleaners.

Fig. 6 shows an optional insert for the female connector tapered second end **63** with the hose **51** threaded into the female connector first end **65**. An internal outer insert **61** can be placed into the second end of the female hose connector until a shoulder **62** on the internal outer insert abuts the outer end of the female connector. The internal outer insert enables a smaller outside diameter vacuum unit to be connected to the hose extension. The internal outer insert **61** reduces the diameter of the female hose connector first end from about 1.25 to 1.15 inches. The internal outer insert can be temporarily or permanently placed on the female hose connector first end.

Figs. 7 and 8 show the parts of the extension assembled in a container **70** for transport and storage. The kit contains from four to six extensions **10** each with a male connector **20** and female connector **19**; a hose extension **50** with a male connector **52** and a female connector **67**; a first adapter **30**; a clog preventer **40**; an outer internal insert **61**; and an internal recessed insert **69** packaged as a unit. The container **70** shown is in the form of a clear plastic "clamshell," vacuum formed to house the parts of the kit for transport and storage. The clamshell container securely holds the parts that fit into a molded area storage compartment in a back side **71**. A cover **74** on the front side is connected to the back side by a living hinge **72** on the bottom side of the container. The back side and front side are

removably secured together by a hanger type hook **73** on the top side. The portion of the hanger on the back side **71** and front side cover **74** snap fit together to removably hold the cover in place over the back side. The hook allows the clamshell container **70** to be placed on a closet pole or hook for easy storage and forms a grip for transport.

An elastic adapter can be used for unusual or odd sized connectors. By providing an elastic adapter an essentially straight tube can be used as an adapter that can be compressed some, to fit within female connectors, and stretched, to fit over the outside diameter of larger connectors. The elastic adapter can be used to join male connectors together and can be stretched over the outside of connectors intended to be joined with a male connector. The elastic adapter can be manufactured less expensively yet fulfill the need to join components without fluid leakage.

The elastic adapter can take the form of a straight cylindrical tube 80 shown in Fig. 9, or a straight tube 85 having radial internal ridges 89 shown in Fig. 10, or a straight tube 95 having longitudinal external ribs 94 as shown in Fig. 11.

The elastic adapter straight tube 80 of Fig. 9, in its simplest form is an extruded elastomer having an inner passage 82 and a cylindrical outer surface 81. Using elastic tubes with a wall 83 thickness of 1/4 inch plus or minus 1/32 inch, with inside diameters of 3/4 inch and/or 1 inch and/or 1¼ inch can be used. These tubes can be deformed to fit within female

connectors that are up to 10% smaller than the outside diameter of the elastic adapter or up to 1/32 inch smaller than the outside diameter of the tube. The tubes can be stretched to fit over a connector that is up to twice the inside diameter of the elastic adapter. The tube can be preferably from 3½ inch to 5½ inch in length. Various elastic materials can be used with one acceptable material being the compound 1200 BIKE produced by the Grab On® Products Inc. of Walla Walla, Washington.

The second flexible adapter 85 of Fig. 10 is essentially the same as the adapter 80 of Fig. 9 except that it is provided with radial ridges 89 that extend inwardly from the tube inner wall 84 into the inner passage 87. The outer wall 86 is essentially cylindrical. The radial ridges permit the adapter to couple different size connectors together as they restrict the distance the fixtures enter the adapter while centering the fixtures with respect to the adapter center and first end 88 and second end 98. The ridges also strengthen the tube against collapse. To preclude unacceptable restriction of air flow, the ridges 89 should be limited to being 1/8 inch or less.

The third flexible adapter 90 of Fig. 11 is essentially the same as the adapter 80 of Fig. 9 except that it is provided with rigidifying ridges 94 extending longitudinally on the outer surface 91. The longitudinal ridges permit the adapter to couple different size connectors together while resisting bending and preventing the collapse of the central area of the adapter between fixtures connector. A collapse would result in a restriction to air flow for any area

the adapter extends into the passage 92 between connectors. The inner tube passage 92 in the tube wall 93 is uninterrupted. The ribs on the adapter are preferably 3/16 inch plus or minus 1/16 inch.

As an alternative, not shown, the adapter may have a combination of external longitudinal ridges on the outer surface and radial internal ridges near the center of the tube.

It is believed that the construction, operation and advantages of this invention will be apparent to those skilled in the art. It is to be understood that the present disclosure is illustrative only and that changes, variations, substitutions, modifications and equivalents will be readily apparent to one skilled in the art and that such may be made without departing from the spirit of the invention as defined by the following claims.